

Systemic Review of the Bottlenecks and Priority Corresponding Strategic Interventions of Enhancing Environmental Management and Sustainability in the case of Ethiopia country

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ABSTRACT

Appropriate management of natural resources (land, soil, water and environment) is a powerful influence on environmental quality and sustainability and can lead to increased long term agricultural production and productivity. Therefore, the extension system needs to introduce appropriate natural resources in order to avert environmental degradation. In this sub-section, four extension-related bottlenecks that affect resource management have been identified. These are, (1) Poor linkage between natural resource management and livelihood strategies, (2) Limited capacity on environment and Natural Resource Management (3) Low access to and use of climate smart agricultural technologies and agro-meteorological information and (4) Less attention to environment sustainability in the extension advisory service. This strategy has developed four systemic interventions to address these bottlenecks.

Keywords: Bottlenecks, Priority Interventions of Enhancing Environmental Management and Sustainability

1. Introduction

1.1. *Background of the study.*

Subsistence smallholder agriculture has continuously dominated economic development policy in Ethiopia (Mellor, 2014). This sector contributes about 39% of the country's Gross Domestic Product (GDP) by end of 2014/15. Crop and livestock subsectors accounted for 27.4% and 7.9% respectively, while the residual was accounted for by forestry and fishing (NPC, 2016).

Despite its pivotal role, the performance of this sector has remained largely unsatisfactory (Gregory, 2013). The sector is characterized by subsistence oriented, low input and output. In addition, over 90% of cultivated land has been dependent on rain-fed, making the sector highly susceptible to climate change (ATA, 2016). Economy, environment and society are the three major interconnected drivers of sustainable development (Giddings et al., 2002). Building harmony between them is of paramount importance in order to bring sustainable development. Sustainable natural resources management is positively influence environmental quality, sustainability and agricultural production and productivity. The expansion of agricultural land as a result of rapid population growth has aggravated environmental deterioration in Ethiopia. Moreover, inappropriate utilization of natural resources leads to severe moisture loss, continuous degradation of fertile soil, loss of vegetative cover and biodiversity and subsequently to a decline in agricultural production and productivity. Types of farming practices also affect the environment and other natural resources in many different ways. In this strategy the following major environmental sustainability bottlenecks have been identified and key interventions are.

1.2 Systemic Review of the Bottlenecks undermining Enhancing Environmental Management and Sustainability

1.2.1 Poor link of natural resource management extension services with livelihood strategies: In the last four decades, tremendous efforts and large investment have been made including through community mobilization or campaign to conserve natural resources across the country. These efforts have resulted in remarkable achievements new recently for example, in watershed management, soil and water conservation (SWC) and afforestation, which can be exemplary for other countries. However, absence of land use plan, lack of sense of ownership by the local community, lack of genuine participation, poor maintenance, etc. have contributed to the low adoption of natural resource practices. This is due to the fact that the current natural resource activities are poorly linked with livelihood strategies and consequently the practices are not sustainable.

1.2.2 Limited capacity on environment and natural resource management: Natural resource management needs a specialized knowledge and expertise at all levels. However, from grassroots level evidence and continued deterioration of natural resource, one can suggest that there is a limited capacity and know-how on NRM by development practitioners working in the sectors in particular by DAs and farmers. Much of the trainings implemented by NRM focus on the technical content of the NRM and they lack extension methodologies and approaches to bring necessary behavioral changes of the farming communities.

Bio-physical SWC, as one key activity of natural resource management, requires its own technical specification and standards, which needs highly calibrated professionals. If natural resource management

practices are poorly implemented, they aggravate further degradation. Thus, special attention should be given to equip the staff with detail knowledge and skills of natural resource management.

1.2.3 Low access to and use of climate smart agricultural technologies and agro-metrological information: Climate change and its impact on environment, economies and food security is the crucial issue in Ethiopia. The smallholder farmers of Ethiopia are the most vulnerable to the impacts of climate change. This is because they are dependence on the natural environment for their livelihood and lacks the means to cope up with the impacts of climate change. Drought usually occurs as a result of climate change, which in turn, negatively affecting crop and livestock production. However, the extension system is not in position to promote climate smart agriculture and agro-metrological information to smallholder farmers.

1.2.4 Less attention to environment sustainability in the extension advisory service: Despite high performances in terms of agricultural productivity growth, agricultural development in Ethiopia remains constrained by many issues of environmental sustainability. High priority is given to short-term food security and agricultural productivity and consequently the extension system is not sustainable-oriented. In addition, current farming practices in Ethiopian smallholder agriculture are generally not sustainable but rather extractive resulting in significant impacts on the physical environmental, which in turn constrains long term agricultural growth.

Agricultural unsustainable practices in Ethiopia includes, but are not limited to, encroachment of farming into higher elevations and steep slopes and farming of slopes without conservation measures; cereal mono-cropping; continuous farming and removal of crop/livestock residues (stalk, roots, manure, etc.) for various purposes; deforestation, overgrazing; limited use of renewable energy in mechanized farming and irrigation functions; and excessive/inappropriate tillage as well as inappropriate use of inputs. In general, any attempt to increase agricultural production without considering the costs to and degradation of natural resources is unsustainable.

2. Strategy of Systemic Interventions of the Bottlenecks undermining Enhancing Environmental Management and Sustainability

Intervention 2.1: Enhance NRM extension services link with livelihood strategies

In order to improve the NRM and minimize the current threat, the recent attention given by the government in extension services must be continued in well-coordinated and system-based approach by linking with livelihoods strategies. Among others, the followings need key attention in the extension services.

- Enhance physical conservation on natural resources through improving advisory services by implementing soil bunds, stone-faced soil bund, *Fanya juu*, terracing, gully control and rehabilitation ...etc.
- Promote biological conservation measures by improving agronomic practices, stabilization of the physical structure, minimum tillage, agro-forestry etc.

The activities mentioned above should be done in collaboration with local communities and development practitioners (NGOs). Concerned Directorates within MoANR at various levels need to work together to ensure alignment of their natural resource activities and to provide full fledge multi-disciplinary extension service to the farming community.

Intervention 2.2: Improve technical capacity of extension staff on NRM

Improve NRM knowledge and skill of extension workers and farmers are of paramount importance to facilitate the natural resource investments and environmental management. This can be done through organizing short and long term training programs specific to natural resource management. Such training must be organized and given by professionals who have rich experiences in the subject through linking with universities, ATVETs and colleges. In addition, there is a need to prepare NRM-based extension guidelines, brochures and leaflets in different local languages that clearly demonstrate the benefits as well as all necessary practices for proper natural resources management. As part of capacity building and motivation, provide recognition and awards for key players on NRM for their outstanding performance and visible contributions are also important.

Intervention 2.3: Promotion of climate smart agriculture and agro-metrology information

The agricultural extension system has a great contribution to **adapt and mitigate the current climate change problems through promotion of appropriate practices and information.** The following interventions are suggested to adapt and mitigate the problem related to climate change.

a. Promote climate smart agriculture such as:

- **Improved crop management:** This includes minimum tillage (where appropriate), contour tillage, raw planting, intercropping, crop rotations, cover cropping, improved seed varieties (stress resistant varieties), mulching, double cropping, crop diversity, and integrated pest management, push-pull technologies, improved storage and processing techniques.
- **Improved livestock management:** This includes better breeds (artificial insemination and crossbreeds), improved forage technologies (new grass & legumes varieties, cut and carry, rotational grazing, and area closure), and improved veterinary services, animal husbandry improvements, destocking, improved grazing capacity of grazing land, rangeland management.
- **Improved Soil and water conservation practices:** This includes activities like, soil test-based fertilizer application, use of compost & manure, Broad Bed Maker (BBM) (to drain excess water in vertisols), green

manure, residual management, bio-fertilizer, lime application, integrated nutrient and soil management, physical and biological soil conservation methods, contour planting, agro-forestry, integrated watershed management.

• **Irrigation water use & Irrigation practice:** This includes Spate Irrigation, Water Harvesting Pits, Supplementary Irrigation, Drip Irrigation, Sprinkler Irrigation, Deficit Irrigation, Alternative Furrow Irrigation, Pitcher Irrigation, Irrigation, Scheduling, Groundwater Restoration, Sediment/Silt Trapping

• **Energy use:** This includes Biogas, Improved stoves, Renewable energy (solar, wind)

b. **Increased access to and use of agro-metrological information:** This can be through promoting FTCs based agro-metrology information and building the capacity of extension staff on agro-met.

Intervention 2.4: Enhance sustainable oriented extension service

Promote changes in farming practices towards greater conservation and efficiency in use of natural resources is of paramount importance to bring sustainable development. In line with this, extension service needs to integrate environmental sustainability issues in the overall agricultural development interventions.

This enables to ensure agricultural growth and enhanced incomes of smallholder farmers in a socially acceptable and equitable manner while protecting and improving the natural resource base. In order to promote sustainable agricultural practices in the extension system, the following interventions are suggested.

- Prepare extension package for sustainable practices in collaboration with concerned stakeholders
- Train in sustainability indicators for all experts and DA in extension system
- Create curriculum on sustainability issues in higher learning institute and ATCET
- Raise farmers' awareness and understanding of the potential benefits of sustainable agriculture practices.
- Institutionalize climate smart and sustainable agriculture

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